# Cody Rivera

*Curriculum Vitae*
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## ▬▬▬ Education

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| 2022–present | **Ph.D. in Computer Science**, *University of Illinois Urbana-Champaign*, Urbana, IL<br>Expected Completion Date: May 2027. |
| 2018–2022 | **B.S. in Computer Science and Mathematics**, *The University of Alabama*, Tuscaloosa, AL<br>*Summa Cum Laude.*<br>Minor: Randall Research Scholars Program. |

## ▬▬▬ Research Experience

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| 2019–2022 | **Undergraduate Research Assistant, High-Performance Computing and Data Analytics Lab**, *The University of Alabama/Washington State University*, Tuscaloosa, AL<br>Research parallel GPU algorithms to process vast amounts of data in machine learning, simulation, and scientific computation workloads more efficiently. Supervised by Dr. Dingwen Tao. |
| Summer 2021 | **Science Undergraduate Laboratory Internship (SULI) Program Intern**, *Argonne National Laboratory*, Virtual Internship<br>Improved the performance of lossy decompression for scientific data, including simulation snapshots and deep neural networks, for faster data processing and analysis on GPUs. Supervised by Dr. Sheng Di. |

## ▬▬▬ Publications

### Refereed Publications

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| IPDPS 2022 | **C. Rivera**, S. Di, J. Tian, X. Yu, D. Tao, and F. Cappello, "Optimizing Huffman Decoding for Error-Bounded Lossy Compression on GPUs," *The 36th IEEE International Parallel and Distributed Processing Symposium*, Virtual Event, May 30-June 3, 2022, pp. 717-27. |
| Cluster 2021 | J. Tian, S. Di, X. Yu, **C. Rivera**, K. Zhao, S. Jin, Y. Feng, X. Liang, D. Tao, and F. Cappello, "Optimizing Error-Bounded Lossy Compression for Scientific Data on GPUs," *2021 IEEE International Conference on Cluster Computing*, Virtual Event, September 7-10, 2021, pp. 283-93. |
| IPDPS 2021 | J. Tian, **C. Rivera**, S. Di, J. Chen, X. Liang, D. Tao, and F. Cappello, "Revisiting Huffman Coding: Toward Extreme Performance on Modern GPU Architectures," *The 35th IEEE International Parallel and Distributed Processing Symposium*, Virtual Event, May 17-21, 2021, pp. 881-91. |
| JPDC | **C. Rivera**[*], J. Chen[*], N. Xiong, S. Song, and D. Tao, "TSM2X: High-Performance Tall-and-Skinny Matrix-Matrix Multiplication on GPUs," *Journal of Parallel and Distributed Computing*, Volume 151, 2021, pp. 70-85. |
| PACT 2020 | J. Tian, S. Di, K. Zhao, **C. Rivera**, M. H. Fulp, R. Underwood, S. Jin, X. Liang, J. Calhoun, D. Tao, and F. Cappello, "cuSZ: An Efficient GPU-Based Error-Bounded Lossy Compression Framework for Scientific Data," *The 29th International Conference on Parallel Architectures and Compilation Techniques*, Atlanta, GA, Oct 3-7, 2020, pp. 3-15. |

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[*]Equal contribution

## Software Artifacts

**cuSZ:** A GPU version of the R&D 100 award-winning SZ, an error-bounded lossy compressor for scientific data. Implemented in CUDA C++ for Nvidia GPUs. Compresses data with compression ratios up to 3.48x higher than other state-of-the-art GPU lossy compressors. URL: `https://szcompressor.org/`

**TSM2X:** A collection of two GPU algorithms for multiplying irregular-shaped tall-and-skinny matrices: TSM2L and TSM2R. Implemented in CUDA C++ and tuned for Nvidia GPU architectures. Obtains average speedups of up to 1.9x over the vendor-supplied CUBLAS library. URL: `https://github.com/codyjrivera/tsm2x-imp`

## Technical Skills

**Programming Languages:** C, C++, Python, Java, JavaScript, TypeScript, SQL

**Libraries/Frameworks:** CUDA, OpenMP, Pandas, App Engine, JUnit, Angular, Material, Bootstrap, Jest

**Technologies/Tools:** Git, GitHub, Jupyter, Google Cloud, npm, HTML, CSS, LaTeX

## Other Experience

2019–2020 **Undergraduate Teaching Assistant (CS 100)**, *The University of Alabama*, Tuscaloosa, AL
Tutored students during lab sessions for introductory computer science courses. Graded student programming projects and proctored exams.

Summer 2020 **Student Training in Engineering Program (STEP) Intern**, *Google*, Virtual Internship
Developed GrowPod, a web app that allows users to join, create, and administer community gardens, using Google Cloud App Engine and Angular. Worked on a team with two other interns and completed the software development lifecycle.

## Awards and Honors

2022–2026 University of Illinois Urbana-Champaign Graduate College Fellowship

2022–2026 University of Illinois Urbana-Champaign SURGE Fellowship

Summer 2022 Oregon Programming Languages Summer School Housing Fellowship

Spring 2022 University of Alabama Department of Computer Science Outstanding Undergraduate Award

Spring 2022 Randall Research Scholars Program H. H. Chapman Outstanding Computer User Award

Fall 2021 R&D 100 Award Winner (as part of "SZ: A Lossy Compression Framework for Scientific Data")

Summer 2020 Randall Research Scholars Program Outstanding Sophomore Award

2018–2022 University of Alabama Engineering Leadership Scholarship

2018–2022 University of Alabama Presidential Scholarship

## Activities and Memberships

Summer 2022 Oregon Programming Languages Summer School

Spring 2021 Randall Research Scholars Program Selection Committee

2020–present Upsilon Pi Epsilon

2020–present Pi Mu Epsilon

2018–present Association for Computing Machinery (ACM)

2018–2022 University of Alabama Catherine J. Randall Research Scholars Program